Remarks

The Applicants respectfully request reconsideration of the application in view of the following remarks. Claims 67-69 and 71-132 are pending.

Claims 1-66 and 70 have been canceled without prejudice. In the final Office action, the Examiner rejects claims 67-77, 79-97, 99-110, 112-116, 121, 122 and 124-132 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,933,451 to Ozkan et al. ("Ozkan patent") in view of U.S. Patent No. 6,459,811 to Hurst ("Hurst patent"). The Examiner rejects claims 117-120 under 35 U.S.C. § 103(a) as being unpatentable over the Ozkan patent in view of the Hurst patent and U.S. Patent No. 5,541,852 to Eyuboglu et al. ("Eyuboglu patent"). The Examiner rejects claims 78, 98, 111 and 123 under 35 U.S.C. § 103(a) as being unpatentable over the Ozkan patent in view of the Hurst patent and U.S. Patent No. 6,873,629 to Morris et al. ("Morris patent"). The Applicants respectfully disagree with the rejections.

I. The Ozkan Patent.

In the interest of reaching a shared understanding of the disclosure of the Ozkan patent, the Applicants make the following observations.

Multiplexer system with rate allocation based on complexity.

In the Ozkan patent, a multiplexer system (*see* Figure 1) includes input terminals 5 for different channels of video, and each of the input terminals 5 is coupled to a channel processor 10. Ozkan patent, 2:57-3:6, Figure 1. The multiplexer system also includes a bit rate allocator 30.

As shown in Figures 1 and 2, each processor 10 includes a complexity output (coupled to a complexity input of the bit rate allocator 30) and a control input (coupled to a "quota" control output of the bit rate allocator 30). Ozkan patent, 3:14-21, Figure 2. Each processor 10 includes a constant bit rate encoder 14. The control input of the processor 10 is input to the encoder 14. Ozkan patent, 3:48-62, Figure 2. Each encoder 14 encodes video for a given period such as 12 pictures, which can be a group of pictures ("GOP"), at a bit rate determined by the signal at its control input. Ozkan patent, 3:48-62, 4:63-5:8.

Each processor 10 also includes a complexity analyzer 16. The output of the complexity analyzer 16 (as the output of the processor 10) is the corresponding input of the bit rate allocator 30.

Ozkan patent, 3:48-62, Figure 2. The bit rate allocator 30 thus receives complexity inputs from the respective complexity analyzers 16 of processors 10 for different channels. Ozkan patent, 3:48-62, 5:63-6:29. Using the complexity inputs, a component of the bit rate allocator 30 "determines the quota of bits for the next quota period for each of the encoders, and supplies signals representing those quotas to the plurality 10 of channel processors via the QUOTA output terminals at the next quota period." Ozkan patent, 6:26-29; *see also* 4:63-5:8. The bit rate allocator 30 thus produces quota control outputs to the respective encoders 14 of processors 10 for different channels. Ozkan patent, 3:48-62, 5:63-6:29.

Rate allocation decisions during encoding.

Much of the Ozkan patent is devoted to describing encoder-side decisions concerning how to allocate bits from period to period across different video channels. *See, e.g.*, Ozkan patent, 3:22-46, 8:63-9:36. R^i indicates the number of bits allocated to a video channel i over a quota period. *Id.* When a video channel has more complex content, relatively more bits are allocated to that video channel, with fewer bits allocated to other video channels. *Id.* When a video channel has less complex content, relatively fewer bits are allocated to that video channel, with more bits allocated to other video channels. *Id.* In this way, bits of an overall budget R are generally allocated to different video channels depending on video complexity.

The Ozkan patent describes refining allocations in various situations. For example, the Ozkan patent describes setting a minimum bit rate allocation for a channel: (a) to prevent quality from dropping "precipitously" (Ozkan patent, 9:27-29), (b) to account for the possible complexity of scene changes (Ozkan patent, 9:29-36), or (c) to match a minimum imposed by the operator of a transmission link (Ozkan patent, 10:34-37). As other examples, the Ozkan patent describes setting a maximum bit rate allocation for a channel: (d) to match a point at which "no improvement in the quality of the reproduced image is visible," or (e) to match a maximum imposed by the operator of a transmission link. Ozkan patent, 10:27-37.

Considering decoder buffer size D in rate allocation decisions during encoding.

The Ozkan patent describes further refining allocated bit rates to provide buffer management, for example, to ensure that input buffers of receiver decoders do not overflow or underflow. Ozkan

patent, 10:54-11:57. The Ozkan patent indicates a decoder buffer size D is "fixed." Ozkan patent, 10:62. According to the Ozkan patent, if an encoder buffer size is capped, the bit rate allocation R^i for a video channel can vary between a minimum bit rate allocation R_{min} for the video channel and a maximum bit rate allocation R_{max} for the video channel without inducing underflow or overflow. Ozkan patent, 10:62-67. The Ozkan patent then describes how this constraint on buffer size can be relaxed, loosening constraints on maximum and minimum bit rate allocations. Ozkan patent, 11:5-12:44.

II. Claims 67-69, 71-77, 79-97, 99-110, 112-116, 121, 122 and 124-132 Should Be Allowable.

The Ozkan patent and the Hurst patent, taken separately or in combination, fail to teach or suggest at least one element of each of claims 67-69, 71-77, 79-97, 99-110, 112-116, 121, 122 and 124-132.

Claims 67, as amended, recites:

> at the video decoder, receiving multiple sets of reference decoder parameters signaled for a given bit stream of encoded data for a given video clip, wherein each of the multiple sets comprises a rate parameter and a decoder buffer size parameter for a reference decoder model that specifies constraints on fluctuations of the given bit stream of encoded data for the given video clip, and wherein each of the multiple sets indicates a different and alternative combination of rate parameter and decoder buffer size parameter for the same video images in the given bit stream of encoded data for the given video clip.

According to claim 67, a video decoder receives multiple sets of reference decoder parameters signaled for a given bit stream of encoded data for a given video clip. Each of the multiple sets comprises a rate parameter and a decoder buffer size parameter for a reference decoder model that specifies constraints on fluctuations of the given bit stream of encoded data for the given video clip. And, each of the multiple sets indicates a different and alternative combination of rate parameter and decoder buffer size parameter for the same video images in the given bit stream of encoded data for the given video clip. The video decoder determines an operating condition (indicating, for example, peak rate or decoder buffer size) using any of the multiple sets. The video decoder then decodes the encoded data for the given video clip in accordance with the operating condition.

The application describes some advantages of signaling multiple sets of reference decoder parameters in certain example implementations. For example, a content provider can encode video in

a bit stream once but determine multiple sets of reference decoder parameters that contain the bit stream, which facilitates delivery of the same bit stream of encoded video to multiple devices of different capabilities or to multiple devices over channels with different peak transmission rates. Application, pages 4-5 and 24-25. As another example, a given decoder can reduce the size of its decoder buffer (and thereby reduce startup delay before playback begins) by considering how the peak transmission rate applicable for the decoder relates to one or more of the rate parameters in the multiple sets of reference decoder parameters that are signaled. Application, pages 20-25. Or, as still another example, a given decoder can reduce the peak transmission rate used to deliver encoded video to it by considering how its buffer size relates to one or more of the buffer size parameters in the multiple sets of reference decoder parameters that are signaled. *Id*.

Like claim 67, each of claims 92, 128 and 132, as amended, recites:

> at the video decoder, receiving multiple sets of reference decoder parameters signaled for a given bit stream of encoded data for a given video clip, wherein each of the multiple sets comprises a rate parameter and a decoder buffer size parameter for a reference decoder model that specifies constraints on fluctuations of the given bit stream of encoded data for the given video clip, and wherein each of the multiple sets indicates a different and alternative combination of rate parameter and decoder buffer size parameter for the same video images in the given bit stream of encoded data for the given video clip.

Claim 108, as amended, recites:

> at the video decoder, receiving a number parameter that indicates how many sets of reference decoder parameters are signaled for a given bit stream of encoded data for a given video clip;
>
> at the video decoder, receiving multiple sets of reference decoder parameters signaled for the given bit stream of encoded data for the given video clip, wherein each of the multiple sets comprises a rate parameter and a decoder buffer size parameter for a reference decoder model that specifies constraints on fluctuations of the given bit stream of encoded data for the given video clip, and wherein each of the multiple sets represents a different and alternative point along a rate-decoder buffer size curve for the same video images in the given bit stream of encoded data for the given video clip.

Claim 121, as amended, recites:

> at the video decoder, receiving a number parameter that indicates how many sets of reference decoder parameters are signaled for a given bit stream of encoded data for a given video clip;
>
> at the video decoder, receiving multiple sets of reference decoder parameters signaled for the given bit stream of encoded data for the given video clip, wherein each

of the multiple sets comprises a rate parameter and a decoder buffer size parameter for a reference decoder model that specifies constraints on fluctuations of the given bit stream of encoded data for the given video clip

… wherein each of the multiple sets represents a different and alternative point along a rate-decoder buffer size curve for the same video images in the given bit stream of encoded data for the given video clip.

The Ozkan patent fails to teach or suggest, at a video decoder, receiving multiple sets of reference decoder parameters that are signaled for a bit stream of encoded data.

The Examiner appears to map the "rate parameter" and "decoder buffer size parameter" language of claims 67, 92, 108, 121, 128 and 132 to rate allocation *R* and buffer size *D* of the Ozkan patent. Final Office action, page 3. Even if this mapping were correct (and the Applicants believe it is not), the *R* and *D* values in the Ozkan patent are used within the encoder-side multiplexer system of Figure 1 of the Ozkan patent. Ozkan patent, 10:54-11:57. *The R and D values in the Ozkan patent are not signaled for a bit stream of encoded data, nor are they received by a video decoder. Id.* The Ozkan patent therefore leads away from, at a video decoder, "receiving multiple sets of reference decoder parameters signaled" for a given bit stream of encoded data for a given video clip, as recited in claims 67, 92, 108, 121, 128 and 132, respectively. The Ozkan patent is even further from teaching or suggesting "at the video decoder, receiving a number parameter that indicates how many sets of reference decoder parameters are signaled," as recited in claims 108 and 121, respectively.

The Ozkan patent fails to teach or suggest multiple sets of parameters indicating different and alternative combinations of rate and decoder buffer size parameters for the same video images.

The Ozkan patent describes a minimum bit rate allocation R_{min} for a channel, a maximum bit rate allocation R_{max} for a channel, and a decoder buffer size *D*. Ozkan patent, 10:27-67. Even if, for the sake of argument, R_{min}, R_{max} and *D* were considered to be reference decoder parameters (and the Applicants believe they are not), R_{min}, R_{max} and *D* constitute a single set of parameters for video images in a single channel. Using a single set of R_{min}, R_{max} and *D* parameters for video images in a channel (as in the Ozkan patent) is different than, and leads away from, multiple sets of reference decoder parameters where "each of the multiple sets indicates a *different and alternative combination* of rate parameter and decoder buffer size parameter *for the same video images in the given bit stream* of encoded data for the given video clip," as recited in claims 67, 92, 128 and 132, respectively. Using a

single set of R_{min}, R_{max} and D parameters for video images in a channel (as in the Ozkan patent) is also different than, and leads away from, multiple sets of reference decoder parameters where "each of the multiple sets represents a *different and alternative point along a rate-decoder buffer size curve for the same video images in the given bit stream* of encoded data for the given video clip," as recited in claims 108 and 121, respectively.

The Ozkan patent also describes changing a rate parameter R^i between quota periods (e.g., groups of 12 pictures) for a video channel, such that R^i can vary between R_{min} and R_{max}. Ozkan patent, 9:10-36, 10:54-11:36. A given quota period has one value for the rate parameter R^i. *Id.* Even if, for the sake of argument, R^i were considered to be a reference decoder parameter (and the Applicants believe it is not), using one set of values for the rate R^i and D parameters for the video images in a given quota period of video (as in the Ozkan patent) is different than, and leads away from, multiple sets of reference decoder parameters where "each of the multiple sets indicates a *different and alternative combination* of rate parameter and decoder buffer size parameter *for the same video images in the given bit stream* of encoded data for the given video clip," as recited in claims 67, 92, 128 and 132, respectively. Using one set of values for the rate R^i and D parameters for the video images in a given quota period of video (as in the Ozkan patent) is also different than, and leads away from, multiple sets of reference decoder parameters where "each of the multiple sets represents a *different and alternative point along a rate-decoder buffer size curve for the same video images in the given bit stream* of encoded data for the given video clip," as recited in claims 108 and 121, respectively.

Finally, the Ozkan patent describes multiple video channels, with each channel having its own set of R_{min}, R_{max} and D, and it describes changing a rate parameter R^i from channel to channel (e.g., R^0 for channel 0, R^1 for channel 1, etc.) for a quota period. This too leads away from the above-cited language of claims 67, 92, 108, 121, 128 and 132, respectively.

In summary, changing a rate parameter from quota period to quota period (e.g., GOP to GOP) for a video channel (as in the Ozkan patent) and changing a rate parameter from channel to channel (as in the Ozkan patent) involve changing the rate parameter for different video images. Even if, for the sake of argument, this results in different "sets of parameters" for the different video images, it leads away from different, alternative sets of parameters that are signaled for the same video images in a given bit stream, as recited in claims 67, 92, 108, 121, 128 and 132, respectively.

The Hurst patent fails to teach or suggest, at a video decoder, receiving multiple sets of reference decoder parameters that are signaled for a bit stream of encoded data.

Combining the Hurst patent with the Ozkan patent fails to remedy the foregoing deficiencies of the rejections of claims 67, 92, 108, 121, 128 and 132, respectively. Like the Ozkan patent, the Hurst patent fails to teach or suggest the above-cited language of claims 67, 92, 108, 121, 128 and 132, respectively.

In the Hurst patent, different encoders use different video buffer verifier ("VBV") models for different bitstreams. Hurst patent, 4:17-29, 7:40-45. Using different VBV models for different bitstreams, with each encoder having its own VBV model for one bit stream (as in the Hurst patent), still involves using a single set of VBV parameters for a given bit stream. This is different than, and leads away from, at a video decoder, "receiving multiple sets of reference decoder parameters signaled" for a given bit stream of encoded data for a given video clip (as in claim 67, 92, 108, 121, 128 or 132). The Hurst patent is even further from teaching or suggesting "at the video decoder, receiving a number parameter that indicates how many sets of reference decoder parameters are signaled," as recited in claims 108 and 121, respectively.

The Hurst patent fails to teach or suggest multiple sets of parameters indicating different and alternative combinations of rate and decoder buffer size parameters for the same video images.

Moreover, using different VBV models for different bitstreams (as in the Hurst patent), even considered collectively, still involves using different VBV models for different video pictures. This is different than, and leads away from, multiple sets of reference decoder parameters where "each of the multiple sets indicates a *different and alternative combination* of rate parameter and decoder buffer size parameter *for the same video images in the given bit stream* of encoded data for the given video clip," as recited in claims 67, 92, 128 and 132, respectively. Using different VBV models for different bitstreams (as in the Hurst patent) is also different than, and leads away from, multiple sets of reference decoder parameters where "each of the multiple sets represents a *different and alternative point along a rate-decoder buffer size curve for the same video images in the given bit stream* of encoded data for the given video clip," as recited in claims 108 and 121, respectively.

More generally, the Examiner has combined the VBV features of the Hurst patent with rate control mechanisms of the Ozkan patent. Even if, for the sake of argument, the VBV model

parameters of the Hurst patent qualify as reference decoder parameters, simply incorporating them into the Ozkan patent would not result in any change to what is signaled according to the Ozkan patent. At most, one set of VBV model parameters would still be used for a given channel in the Ozkan-Hurst combination. For a given channel, the rate control mechanisms of the Ozkan patent would still adjust rate allocations within the minimum or maximum rates allowed for the channel, still considering the minimum rate R_{min}, maximum rate R_{max} and decoder buffer size D already described in the Ozkan patent. The combination proposed by the Examiner would still lack "multiple sets of reference decoder parameters" signaled as *different, alternative sets of parameters for the same video images in a given bit stream*, and thus would still lack the above-cited language of claims 67, 92, 108, 121, 128 and 132, respectively.

Claims 67-69, 71-77, 79-97, 99-110, 112-116, 121, 122 and 124-132 should be allowable.

For at least the foregoing reasons, claims 67, 92, 108, 121, 128 or 132 should be allowable. Each of dependent claims 68-69, 71-77, 79-91, 93-97, 99-107, 109, 110, 112-116, 122, 124-127 and 129-131 depends directly or indirectly from, and includes the language of, claim 67, 92, 108, 121, 128 or 132, and should also be allowable. The Applicants will not belabor the merits of the separate patentability of these dependent claims.

Finally, the Applicants respectfully disagree with the findings that the Examiner has made by Official Notice in the rejections of claims 79, 81, 97, 101, 110 and 124. The Applicants respectfully disagree with the way the Examiner has used Official Notice in all rejections of the claims.

III. Claims 117-120 Should Be Allowable.

In the final Office action, the Examiner rejects claims 117-120 under 35 U.S.C. § 103(a) as being unpatentable over the Ozkan patent in view of the Hurst patent and the Eyuboglu patent. The Applicants respectfully disagree.

As explained in the previous section, the Ozkan patent and the Hurst patent, taken separately or in combination, fail to teach or suggest, at a video decoder, "receiving multiple sets of reference decoder parameters signaled for a given bit stream of encoded data for a given video clip" or "each of the multiple sets indicates a different and alternative combination of rate parameter and decoder buffer size parameter for the same video images in the given bit stream of encoded data for the given video

clip," as recited in claim 117. Combining the Eyuboglu patent with the Ozkan patent and the Hurst patent fails to remedy the deficiencies of the rejection of claim 117. The Eyuboglu patent describes transcoding a constant bit rate video bit stream to a variable bit rate video bit stream and packetizing the variable bit rate video bit stream into packets for transport over a packet-switched network. Eyuboglu patent, Abstract. The Eyuboglu patent does not teach or suggest the above-cited language of claim 117. Thus, taken separately or in combination, the Ozkan patent, the Hurst patent and the Eyuboglu patent fail to teach or suggest the above-cited language of claim 117.

Claim 117-120 should be allowable. The Applicants will not belabor the merits of the separate patentability of dependent claims 118-120.

IV. Claims 78, 98, 111 and 123 Should Be Allowable.

In the final Office action, the Examiner rejects claims 78, 98, 111 and 123 under 35 U.S.C. § 103(a) as being unpatentable over the Ozkan patent in view of the Hurst patent and the Morris patent. The Applicants respectfully disagree.

Each of claims 78, 98, 111 and 123 depends directly or indirectly from, and includes the language of, independent claim 67, 92, 108 or 121. Taken separately or in combination, the Ozkan patent, the Hurst patent and the Morris patent fail to teach or suggest the above-cited language of claims 67, 92, 108 and 121, respectively. As explained above, the Ozkan patent and the Hurst patent do not teach or suggest the above-cited language of claims 67, 92, 108 and 121, respectively. Combining the Morris patent with the Ozkan patent and the Hurst patent fails to remedy the deficiencies of the rejections of claims 67, 92, 108 and 121. The Morris patent describes conversion of input data streams in MPEG-2 Transport Stream format into output data streams in MPEG-2 Program Stream format (Morris patent, Abstract), but does not teach or suggest the above-cited language of claims 67, 92, 108 and 121, respectively.

For at least these reasons, claims 78, 98, 111 and 123 should be allowable. The Applicants will not belabor the merits of the separate patentability of these dependent claims.

V. Conclusion.

Claims 67-69 and 71-132 should be allowable. Such action is respectfully requested. The Examiner is invited to call the undersigned attorney at the telephone number below if the Examiner

believes that doing so would further the prosecution of the present application.

Respectfully submitted,

KLARQUIST SPARKMAN, LLP

One World Trade Center, Suite 1600
121 S.W. Salmon Street
Portland, Oregon 97204
Telephone: (503) 595-5300
Facsimile: (503) 595-5301

By / Kyle B. Rinehart /
Kyle B. Rinehart
Registration No. 47,027